QUALITY AND PRICES OF INTRA-EUROPEAN TRADE OF FOOD-INDUSTRY PRODUCTS

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ABSTRACT

The completion of the European Single Market should bring out an exploitation of comparative advantages in production and trade. It is usually assumed that, given the predominance of intraeuropean trade flows in the global import figures of the European Union, efficiency gains from trade creation could be potentially important. However, the analysis of the effects of the Single Market on trade specialisation with a greater degree of accuracy requires trade quality indicators to be available. This paper uses the theory of index numbers to establish the relative quality levels of the food industry shipments to the European Internal Market from European Union member countries. It is found a positive relationship between the evolution of country shares on the European food industry and the ability to achieve growing quality levels in the composition of export flows. Finally, intraeuropean food industry trade is analysed accordingly to the pattern of specialisation adopted.

Key words: Intra-industry trade; quality; food industry; European Single Market.
JEL Classification: C43; F15; L66.

RESUMEN

La conclusión del Mercado Único Europeo debería traer consigo una explotación de las ventajas comparativas en la producción y el comercio. Se supone habitualmente que, dada la predominancia de flujos comerciales intraeuropeos en las cifras globales de importación de la Unión Europea, las ganancias de eficiencia derivadas de la creación de comercio podrían ser potencialmente importantes. Sin embargo, un análisis más cuidadoso de los efectos del Mercado Único sobre la especialización comercial requiere de la disponibilidad de indicadores de comercio relativos a la calidad. Este artículo utiliza la teoría de los números índice para establecer los niveles de calidad relativa de los envíos de la industria alimentaria al Mercado Interno Europeo desde los países europeos miembros de Unión. Se encuentra una relación positiva entre la evolución de la participación relativa de un país en la industria alimentaria europea y la capacidad para lograr niveles crecientes de calidad en la composición de los flujos de exportación. Finalmente, se analiza el comercio intraeuropeo de la industria alimentaria teniendo en cuenta el modelo de especialización adoptado.

Palabras claves: comercio intra-industrial; calidad; industria alimentaria, Mercado Único Europeo.

1. Introduction.

Economic literature suggests that completion of the *European Single Market* should bring out, among other effects, an improvement in the allocation of resources within the area, by letting out an exploitation of comparative advantages in production and trade. Given the predominance of *intraeuropean* trade flows in the global import figures of the *European Union*, efficiency gains from trade creation could be potentially important, although under certain assumptions adjustment costs to the new competitive frame could also be relevant. As a consequence, a growing interest has arisen to understand the forms that trade specialisation would adopt once trade barriers are completely eliminated.

Before the nineties, a growing proportion of trade flows between European countries was already consistent with the model of *intraindustrial trade*, which supported the view that adjustment processes could be achieved without imposing excessive social and economic costs. It was commonly taken for granted that this type of commerce reflected diversity of preferences for consumers of similar purchasing power and product differentiation by firms endowed with some market power, besides the effects on trade specialisation of economies of scale. Accordingly, the adjustment costs derived from nontariff barriers elimination would not be relevant, except for some specific sectors, because the reallocation of productive resources as a consequence of changes in commercial specialisation would mainly take place between different lines of production *within* each industrial sector. Contrary, if the *Single Market* had evolved in the direction of a deepening in a scheme of *interindustry trade* between member countries, it would have imposed higher adjustment costs, because that model of trade reflects mainly comparative advantages grounded in different endowments of production factors. Changing the previous scheme of comparative advantages in response to the elimination of nontariff barriers would then have hit the industrial fabric of some countries, both at national and regional level, because of its impact on the use of production factors and on their price.

Intraindustry trade involves in turn very heterogeneous types of trade flows. It is commonly agreed that two main classes should be distinguished, *horizontal trade* in similar products and trade in products differentiated according to their price and quality, *vertical trade*. If *intraindustrial* vertically differentiated trade finally predominates, adjustment costs could be significant, particularly if firms in poorer countries within the area are specialised in cheap products with low quality levels, and if their consumers rapidly develop a preference for better quality import goods that previously were not available in their internal market. On the other hand the persistence of a profile of com-

mercial specialisation in low price products could increase the vulnerability of firms in those countries facing not only imports from higher developed countries belonging to the *European Union*, but also cheaper imports from third countries with a lower level of development.

An analysis of *intraindustry trade* with flows differentiated according to the quality of traded goods (measured through the price), between *European Union* countries, shows that different patterns of specialisation can clearly be observed in northern and southern countries. Germany presents a notable comparative advantage in products of high quality and price, and France in products of medium and high quality, whereas specialisation in Greece and Portugal occurs in low quality product ranges, and for Spain in medium and low qualities (European Commission, 1996). On the other hand, this type of commerce, based on *vertical product differentiation* is the one that has grown more within the *Union* since mid eighties. In the meantime trade flows of a *interindustrial* nature have decreased in relative terms.

The great importance accorded to product differentiation for the development of commercial strategies and the evaluation of welfare effects arising from the fall of the last trade barriers between western European countries points to the need of making trade quality indicators available. These indicators should be of help in order to assess the position of each country in terms of the range of qualities of its exports in order to analyse the effects of the *Single Market* on trade specialisation with a greater degree of accuracy.

This paper approaches in its second heading the methodology issue of building up indices of quality for food industry products in *intraeuropean* trade. The third heading displays the results of the computation of indices for individual countries shipments to the European market, and the fourth quantifies the relative amounts of different types of *intraindustrial* trade (*horizontal* and *vertical)* that takes place between each country, on one side, and the whole of the European Union on the other. The fifth heading sum up the conclusions and the last one refers to the bibliography.

2. Methodological issues.

There is a general agreement that unit-value indices, obtained dividing the value of total imports (exports) by same measure of the quantity of imports (exports), are not appropriate measures of international trade flows prices; despite it, they are commonly utilised to measure import or export prices. Most of the difficulties that arise with the

use of industry level unit values come from improper aggregation over the individual commodity prices, in such a way that their accuracy decreases as the level of aggregation increases. Changes in the mix of commodities that integrate a trade flow (keeping unchanged the total quantity traded) lead to modifications on industry level unit values, which are unrelated to changes in commodity prices. Economic theory of index numbers allows to calculate indices of export prices (for the sake of simplicity, hereafter we will refer to exports, although the reasoning can be equivalently applied to the treatment of import flows) at industry level that avoid this problem of aggregation (Aw and Roberts, 1988); moreover, this procedure allows for the calculation of an index of quality that varies among trade flows.

Following Aw and Roberts (1988), let's assume that a given set of exports generates an aggregate flow of services that can be expressed as the product of the total exports quantity and the contribution in terms of quality per unit of export, as it shows the following expression:

$$F(x^i) = A^i \; H(x^i) \tag{1}$$

where $F(x^i)$ represents the aggregate flow of services from the export bundle x^i; $H(x^i)$ is the total quantity of exports, and, finally, A^i is a quality index that measures the flow of services per unit of export. This last term reveals that the flow of services generated by a given exports bundle could change, even if the total quantity of exports remains unaltered, as a result of an alteration on its composition. Changes toward higher price commodities within an export bundle result in an increase of quality levels (which implies an elevation of the term A^i), and, in consequence, in the aggregate flow of services generated. When a purchaser of an export bundle is willing to pay a higher price for a given aggregate quantity, is because it reports him a greater marginal utility level.

Rewriting expression (1) for a second observation *j* and taking the differences of logarithms, it is possible to construct an index that allows to compare the quality of two export sets, this is:

$$\ln F(x^i) - \ln F(x^j) = \left(\ln A^i - \ln A^j\right) + \left(\ln H(x^i) - \ln H(x^j)\right) \tag{2}$$

Expression (2) shows that the difference between the flow of services corresponding to export sets *i* and *j* can be decomposed into two components; the first one collecting quality differences, and the second one reflecting merely quantity differences.

Assuming that the expenditure of a consumer on a given trade bundle is the result of an optimising consumption behaviour which minimises the expense necessary in order to reach a targeted volume of services $F(x^i)$, and given a vector of commodity prices p_i, using the duality properties in consumption theory, the *cost function* can be expressed as:

$$C\left(F(x^i), p^i\right) = F(x^i)\, c(p^i) \tag{3}$$

where it is assumed that the cost function complies with the usual properties, and that $F(x^i)$ is linearly homogeneous in prices; finally, $c(p^i)$ is the unit cost function.

Substituting (1) in (3), we found that:

$$c\,(p^i) = \frac{C\left(F(x^i), p^i\right)}{A^i\ H(x^i)} \tag{4}$$

Assuming that $C\left(F(x^i), p^i\right) = \sum_k p_k^i x_k^i$ and $H(x^i) = \sum_k x_k^i$, where k represents commodities belonging to export bundle x^i, we can rewrite:

$$c\,(p^i) = \frac{V^i}{A^i} \tag{5}$$

where $V^i = \dfrac{C\left(F(x^i), p^i\right)}{H(x^i)} = \dfrac{\sum_k p_k^i x_k^i}{\sum_k x_k^i}$ is the unit value of export set x^i.

Rewriting (5) for a second observation j and rearranging the resulting expression we get:

$$\ln A^i - \ln A^j = \left(\ln V^i - \ln V^j\right) - \left(\ln c\,(p^i) - \ln c\,(p^j)\right) \tag{6}$$

The unit value of export sets i and j involved in (6) can be obtained directly by knowing aggregated prices and quantities; however, in order to obtain their price indices, it is necessary to use some outcomes of the theory of index numbers. Diewert (1976) showed that if the unit cost function $c(p)$ adopts a *translog* form, and given a linearly homogenous aggregation function $F(x)$, this index can be built up as it shows the following expression:

$$\ln P_{ij} = \ln c(p^i) - \ln c(p^j) = \tfrac{1}{2}\sum_k \left(s_k^i + s_k^j\right)\left(\ln p_k^i - \ln p_k^j\right) \qquad (7)$$

where s_k^i and s_k^j represent the share of commodity *k* on the total cost of export sets *i* and *j*, respectively.

The function $F(x)$ is said to be *flexible* if it gives an second order approximation to an arbitrary unknown functional form (the underlying utility, cost or production function), that is linearly homogeneous and twice differentiable. Moreover, a concrete functional form for an index number is said to be *superlative* if it is exact for a flexible aggregation function. The *translog* price index defined in (7) has, in consequence, the property of being *superlative*.

This index allows to carry out binary comparisons between observations *i* and *j*, which are invariant irrespective of the base observation, but do not have the property of transitivity, given that for observations *i*, *j* and *m*, it holds that $\ln P_{ij} \neq \ln P_{im} - \ln P_{jm}$, which implies that the ordination of the observations affects the outcome of the comparisons. This lack of transitivity does not constitute a problem when we are working with temporal series, since the temporal ordination constitutes a natural form of comparing observations, but, on the other hand, it generates difficulties when cross-section data are used.

In order to overcome these difficulties, Caves, Christensen and Diewert (1982) propose a *translog* index that allows for multilateral comparisons which have the property of being transitive. Comparison between observations *i* and *j* is not made directly, as proposed by expression (7), but rather indirectly as the result of two bilateral comparisons of *i* and *j* with a *virtual* observation built up as the mean over all observations; this multilateral *translog* price index can be expressed as:

$$\ln \mathrm{P}_{ij}^{*} = \tfrac{1}{2}\sum_k \left(\mathrm{s}_k^i + \bar{\mathrm{s}}_k\right)\left(\ln \mathrm{p}_k^i - \ln \bar{\mathrm{p}}_k\right) - \tfrac{1}{2}\sum_k \left(\mathrm{s}_k^j + \bar{\mathrm{s}}_k\right)\left(\ln \mathrm{p}_k^j - \ln \bar{\mathrm{p}}_k\right) \qquad (8)$$

where $\ln \bar{\mathrm{p}}_k \equiv \tfrac{1}{\mathrm{N}}\left(\sum_{i=1}^{\mathrm{N}} \ln \mathrm{p}_k^i\right)$ and $\bar{\mathrm{s}}_k \equiv \tfrac{1}{\mathrm{N}}\left(\sum_{i=1}^{\mathrm{N}} \mathrm{s}_k^i\right)$.

Once unit values and *translog* price indices have been obtained, quality indices can be directly computed by using expressions (5) or (6).

3. Results.

The procedure for building up index numbers described above has been applied to trade flows between *France, the Netherlands, Germany, Belgium-Luxemburg, United Kingdom, Italy* and *Spain*, each separately on one side, and the whole of the *European Union* on another, for chapters 16, 17, 18, 19, 20, 22, and an aggregate including chapters 21 and 23 of *COMEXT* database of *EUROSTAT*; the period studied being 1993-97. Shipments of each country to the *European Internal Market* (*EU-12*) have been taken with at a six-digit level of desaggregation.

The availability of information in terms of value (in thousand of *ecus*), and quantity (in tons), have allowed to obtain *unit import values* tables, that have subsequently been used in order to build *translog* multilateral price indices and aggregate non-weighted unit values indices. Comparing both indices, it has been computed a *quality* index for each product branch, in accordance with the method explained in the previous heading. Lack of information or the inexistence of commercial flows for several years have made unavoidable to approach the problem of zeros in the original table of unit values. It has been solved using a method of imputation previously mentioned in the literature (Aw and Roberts, 1986). *Tables 1* to *6* display the results obtained; figures allow to know the specific rank position that each country occupies according to each index, in 1993 as in 1997, and the rate of change registered in the corresponding index between both years.

Analysing the information contained in the *translog price indices*, two countries, the *United Kingdom* and *Italy*, appear with some frequency within the group of countries with high priced items (in both 1993 and 1997), while *Spain* and *the Netherlands* tend to rank themselves in the low price position in 1993. In 1997 *Spain* appears again with relative frequency between the countries with low food industry prices, but the other places in this group are much more changeable. It is interesting to highlight that in both years some degree of continuity can be noticed, in the sense that, for example, the highest prices of *meat and fish preparations* shipments correspond to Italy, while in *fruits and vegetables* this place belongs to the *United Kingdom*. The cheaper food products elaborated from *cereals* and *cocoa* come mainly from *Spain* in both years.

TABLE 1.- UNIT VALUE, PRICE AND QUALITY INDICES FOR INTRA EU-12 EXPEDITIONS OF PREPARATIONS OF MEAT, FISH OR AQUATIC INVERTEBRATES. France 1993 =1.

	UNIT VALUE INDICES			*TRANSLOG MULTILATERAL PRICE INDICES*			*QUALITY INDICES*		
	1993	*1997*	*Rate of growth 1993-97 (*)*	*1993*	*1997*	*Rate of growth 1993-97 (*)*	*1993*	*1997*	*Rate of growth 1993-97 (*)*
France	1,000	0,901	*-2,6*	1,000	0,980	*-0,5*	1,000	0,920	*-2,1*
Netherlands	0,861	0,781	*-2,4*	0,832	0,817	*-0,5*	1,035	0,957	*-2,0*
Germany	0,923	0,802	*-3,4*	1,031	0,920	*-2,8*	0,895	0,871	*-0,7*
Belgium and Luxembourg	0,878	0,838	*-1,2*	0,865	0,814	*-1,5*	1,015	1,030	*0,4*
United Kingdom	0,865	0,926	*1,7*	0,817	0,904	*2,6*	1,058	1,024	*-0,8*
Italy	1,244	1,128	*-2,4*	1,283	1,144	*-2,8*	0,970	0,986	*0,4*
Spain	0,852	0,836	*-0,5*	0,921	0,878	*-1,2*	0,925	0,953	*0,7*

(*) Cumulative annual rates of growth.

TABLE 2.- UNIT VALUE, PRICE AND QUALITY INDICES FOR INTRA EU-12 EXPEDITIONS OF SUGARS AND SUGAR CONFECTIONERY. France 1993 =1.

	UNIT VALUE INDICES			*TRANSLOG MULTILATERAL PRICE INDICES*			*QUALITY INDICES*		
	1993	*1997*	*Rate of growth 1993-97 (*)*	*1993*	*1997*	*Rate of growth 1993-97 (*)*	*1993*	*1997*	*Rate of growth 1993-97 (*)*
France	1,000	1,054	*1,3*	1,000	1,017	*0,4*	1,000	1,036	*0,9*
Netherlands	1,224	1,168	*-1,2*	1,001	1,076	*1,8*	1,223	1,085	*-2,9*
Germany	1,183	1,007	*-3,9*	0,924	0,904	*-0,5*	1,280	1,114	*-3,4*
Belgium and Luxembourg	1,510	1,397	*-1,9*	0,960	0,986	*0,7*	1,574	1,416	*-2,6*
United Kingdom	1,303	2,038	*11,8*	1,098	1,292	*4,1*	1,186	1,577	*7,4*
Italy	1,126	0,979	*-3,4*	1,145	1,029	*-2,6*	0,983	0,952	*-0,8*
Spain	1,348	2,734	*19,3*	1,198	1,161	*-0,8*	1,125	2,356	*20,3*

(*) Cumulative annual rates of growth.

TABLE 3.- UNIT VALUE, PRICE AND QUALITY INDICES FOR INTRA EU-12 EXPEDITIONS OF COCOA AND COCOA PREPARATIONS. France 1993 =1.

	UNIT VALUE INDICES			*TRANSLOG MULTILATERAL PRICE INDICES*			*QUALITY INDICES*		
	1993	*1997*	*Rate of growth 1993-97 (*)*	*1993*	*1997*	*Rate of growth 1993-97 (*)*	*1993*	*1997*	*Rate of growth 1993-97 (*)*
France	1,000	1,016	*0,4*	1,000	0,957	*-1,1*	1,000	1,061	*1,5*
Netherlands	0,714	0,795	*2,7*	0,920	1,046	*3,3*	0,776	0,760	*-0,5*
Germany	0,880	0,977	*2,7*	0,989	1,020	*0,8*	0,889	0,958	*1,9*
Belgium and Luxembourg	1,186	1,145	*-0,9*	1,270	1,273	*0,1*	0,934	0,900	*-0,9*
United Kingdom	1,170	1,313	*2,9*	1,047	1,208	*3,6*	1,117	1,087	*-0,7*
Italy	1,290	1,080	*-4,4*	1,300	1,261	*-0,8*	0,992	0,856	*-3,6*
Spain	0,734	0,853	*3,8*	0,831	0,927	*2,8*	0,883	0,919	*1,0*

(*) Cumulative annual rates of growth

TABLE 4.- UNIT VALUE, PRICE AND QUALITY INDICES FOR INTRA EU-12 EXPEDITIONS OF PREPARATIONS OF CEREALS, FLOUR, STARCH OR MILK; PASTRYCOOKS' PRODUCTS. France 1993 =1.

	UNIT VALUE INDICES			*TRANSLOG MULTILATERAL PRICE INDICES*			*QUALITY INDICES*		
	1993	*1997*	*Rate of growth 1993-97 (*)*	*1993*	*1997*	*Rate of growth 1993-97 (*)*	*1993*	*1997*	*Rate of growth 1993-97 (*)*
France	1,000	1,057	*1,4*	1,000	1,030	*0,7*	1,000	1,026	*0,7*
Netherlands	1,281	1,220	*-1,2*	1,114	1,056	*-1,3*	1,150	1,155	*0,1*
Germany	1,288	1,129	*-3,2*	1,248	1,077	*-3,6*	1,033	1,048	*0,4*
Belgium and Luxembourg	1,147	1,231	*1,8*	1,026	1,104	*1,9*	1,118	1,115	*-0,1*
United Kingdom	1,305	1,310	*0,1*	1,217	1,245	*0,6*	1,072	1,052	*-0,5*
Italy	0,741	0,742	*0,0*	1,194	1,163	*-0,7*	0,620	0,638	*0,7*
Spain	0,974	0,858	*-3,1*	0,970	0,870	*-2,7*	1,004	0,987	*-0,4*

(*) Cumulative annual rates of growth

TABLE 5.- UNIT VALUE, PRICE AND QUALITY INDICES FOR INTRA EU-12 EXPEDITIONS OF PREPARATIONS OF VEGETABLES, FRUIT, NUTS OR OTHER PARTS OF PLANTS. France 1993 =1.

	UNIT VALUE INDICES			*TRANSLOG MULTILATERAL PRICE INDICES*			*QUALITY INDICES*		
	1993	*1997*	*Rate of growth 1993-97 (*)*	*1993*	*1997*	*Rate of growth 1993-97(*)*	*1993*	*1997*	*Rate of growth 1993-97 (*)*
France	1,000	0,992	*-0,2*	1,000	1,048	*1,2*	1,000	0,946	*-1,4*
Netherlands	0,618	0,731	*4,3*	0,723	0,748	*0,9*	0,855	0,978	*3,4*
Germany	0,990	0,863	*-3,4*	0,964	0,899	*-1,7*	1,027	0,960	*-1,7*
Belgium and Luxembourg	0,764	0,811	*1,5*	0,810	0,856	*1,4*	0,943	0,947	*0,1*
United Kingdom	1,241	1,402	*3,1*	1,166	1,364	*4,0*	1,064	1,028	*-0,9*
Italy	0,640	0,682	*1,6*	0,783	0,882	*3,0*	0,817	0,773	*-1,4*
Spain	0,868	0,836	*-0,9*	0,786	0,795	*0,3*	1,104	1,052	*-1,2*

(*) Cumulative annual rates of growth

TABLE 6.- UNIT VALUE, PRICE AND QUALITY INDICES FOR INTRA EU-12 EXPEDITIONS OF BEVERAGES, SPIRITS AND VINEGAR. France 1993 =1.

	UNIT VALUE INDICES			*TRANSLOG MULTILATERAL PRICE INDICES*			*QUALITY INDICES*		
	1993	*1997*	*Rate of growth 1993-97 (*)*	*1993*	*1997*	*Rate of growth 1993-97(*)*	*1993*	*1997*	*Rate of growth 1993-97 (*)*
France	1,000	1,019	*0,5*	1,000	1,067	*1,6*	1,000	0,954	*-1,2*
Netherlands	0,566	0,981	*14,8*	1,003	3,127	*32,9*	0,564	0,314	*-13,6*
Germany	0,601	0,629	*1,2*	0,757	0,843	*2,7*	0,793	0,746	*-1,5*
Belgium and Luxembourg	0,401	0,591	*10,2*	0,878	2,630	*31,6*	0,457	0,225	*-16,2*
United Kingdom	2,156	1,873	*-3,5*	1,115	1,022	*-2,1*	1,934	1,832	*-1,4*
Italy	0,674	0,823	*5,1*	0,675	0,893	*7,3*	0,999	0,921	*-2,0*
Spain	0,596	0,959	*12,6*	0,714	0,813	*3,3*	0,836	1,180	*9,0*

(*) Cumulative annual rates of growth

Given that *translog indices* show unit value changes in shipments to the *European Market*, after the effect of quality (composition) changes has been removed, it could be safely presumed that they come close to the inflation registered in the corresponding category of goods. Accordingly, the most striking regularities are those that show the *United Kingdom* with high rates of growth in prices, occupying the first place in four of the broad product categories under consideration, and *Germany* and *Spain* between those that experienced much more moderates price rises. By product categories the higher price increases appear in the expeditions of *beverages and liquors*, while price reductions occur in *meat and fish products*, being the only exception the shipments coming from the *United Kingdom*. In the first of these two industries a widening of the initial price variance takes place as a consequence, while in the second a price convergence results.

The dispersion of price levels doesn't seem to have experienced a clear tendency between 1993 and 1997. In fact, whereas the coefficient of variation of *translog* indices of *meat and fish products*, and *cocoa and its preparations* experience a fall between both years, the opposite tendency takes place in all other categories, although in the case of *cereal products* it changes very little.

In relation to *quality indices,* a rough guess of each country relative position could be obtained considering how many times it takes one of the two first or two last positions in the ranking (according to the index values), in the two years analysed. As six product categories are being used twelve *high* and twelve *low* positions for every year have to be evaluated, or twenty-four altogether if both years are simultaneously considered. The sharpest image corresponds to the *United Kingdom*, that appears nine out of twenty-four times with a high level of quality, and never with a low level. In a lesser degree, *Belgium-Luxembourg* could also stand out like an area of food exports characterised by high quality levels, since in four occasions it shows up in any of the two first positions, and only two times between the last. The opposite case is *Italy*, a country that never figures in any of the two first places in order of importance according to the index of quality of her shipments to the European market, but on the other hand appears seven times in the two last places. The ranking positions of all other countries appear to change more frequently.

If instead of comparing positions in two time points, attention is paid to the intensity of changes in the temporal interval lapsed between 1993 and 1997, then it is observed that *Spain* is the country that registers more positive changes, because three times it takes up the first position as for the magnitude of positive increments in the index of quality. Although the ranking in term of absolute *decrease* in quality index is much

more varied and does not offer a clear pattern, *the Netherlands* stands out in some degree.

The highest quality indices correspond in 1997 to the *United Kingdom* for *beverages and liquors*, and *cocoa and their preparations*, to *Spain* concerning to the *sugar and confectionery* and *preparations of fruits and vegetables*, to *the Netherlands* for *cereals and their preparations* and to *Belgium-Luxembourg* in the *manufactured products based on meat and fish*. Finally, it stands out that the dispersion of the indices of quality, measured by the variation coefficient corresponding to each one of the export sectors only decreases slightly or stabilises in the *preparations based on fruits and vegetables*, and in the case of *cereals and its derived products*, since in all the rest experience an elevation between 1993 and 1997.

Table 7 and *Figure 1* pick up country shares on *intraeuropean* expeditions of food industry products in 1997 for each one of the categories considered, and the variation experienced between 1993 and 1997 by each country in their European market share. It should be reminded that it is only a matter of percentage share in the total value of shipments to that market (*EU-12*), and it is not necessarily a proxy of the participation in the apparent consumption of each type of products in this area. In spite of this caveat, the results are illustrative of the competitive position achieved by each country and of the changes that it has undergone in the period.

Figure 1: COUNTRIES' SHARES ON INTRA EU-12 EXPEDITIONS OF FOOD INDUSTRY-PRODUCTS. Percentage points of change between 1993 and 1997.

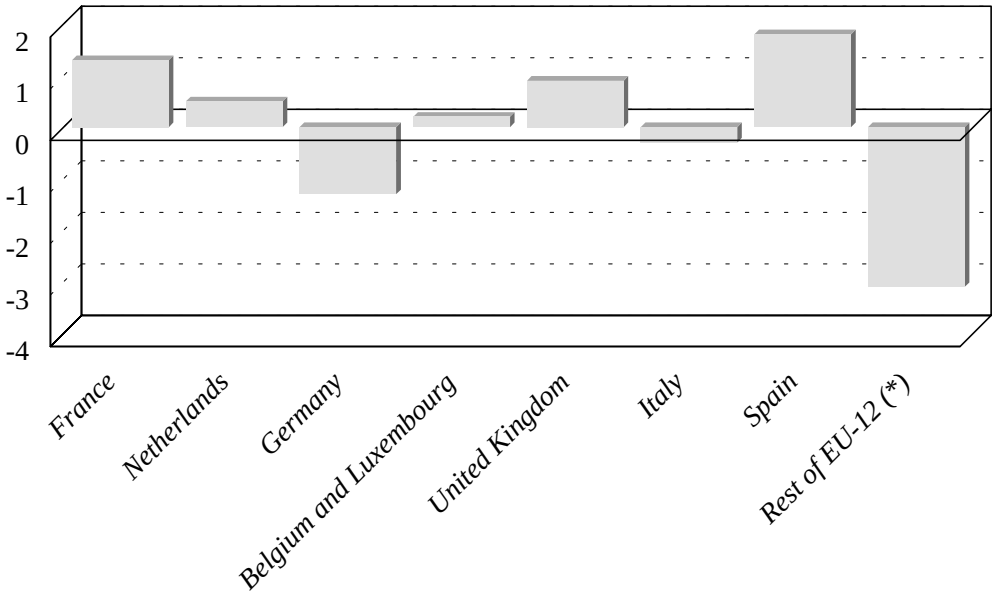


TABLE 7.- INTRA EU-12 EXPEDITIONS OF FOOD INDUSTRY PRODUCTS, 1997.
Shares in percentages.

	France	*Netherlands*	*Germany*	*Belgium and Luxembourg*	*United Kingdom*	*Italy*	*Spain*	*Rest of EU-12 (*)*
Preparations of meat, fish or aquatic invertebrates	13,0	20,1	11,1	13,6	6,3	4,7	7,6	23,6
Sugars and sugar confectionery	38,2	15,1	15,3	10,8	8,0	3,1	4,6	5,0
Cocoa and cocoa preparations	18,5	26,4	17,2	18,8	8,2	4,4	2,4	4,2
Preparations of cereals, flour, starch or milk; pastrycooks' products	15,7	14,1	14,2	13,2	14,0	15,7	3,5	9,5
Preparations of vegetables, fruit, nuts or other parts of plants	11,8	29,0	10,4	13,8	3,2	15,5	9,4	6,9
Beverages, spirits and vinegar	34,2	5,7	7,3	6,0	16,2	12,7	8,5	9,4
Other food industry products	25,0	24,7	13,0	12,1	9,4	3,9	3,0	8,8
TOTAL FOOD INDUSTRY PRODUCTS	*23,7*	*18,0*	*11,7*	*11,5*	*10,5*	*9,4*	*5,9*	*9,3*

(*) Including Ireland, Denmark, Greece and Portugal.

TABLE 8.- SHARE OF TWO-WAY TRADE ON INTRA EU-12 TRADE OF FOOD INDUSTRY PRODUCTS, 1993(*) and 1997. Percentages.

	France	*Netherlands*	*Germany*	*Belgium and Luxembourg*	*United Kingdom*	*Italy*	*Spain*	*Rest of EU-12 (**)*	*EU-12*
Preparations of meat, fish or aquatic invertebrates	*(82,9)* 89,6	*(96,4)* 61,6	*(90,4)* 93,8	*(78,3)* 82,5	*(56,8)* 77,6	*(65,2)* 76,9	*(68,5)* 65,1	*(38,9)* 43,3	*(71,3)* 73,2
Sugars and sugar confectionery	*(25,3)* 22,8	*(76,1)* 98,9	*(77,3)* 83,3	*(92,2)* 95,2	*(97,4)* 95,3	*(93,3)* 96,9	*(37,6)* 46,5	*(66,9)* 69,7	*(65,9)* 69,9
Cocoa and cocoa preparations	*(99,7)* 93,8	*(59,5)* 36,9	*(83,7)* 86,1	*(90,7)* 88,9	*(99,9)* 85,7	*(96,9)* 93,6	*(92,4)* 97,4	*(58,7)* 60,5	*(84,2)* 80,7
Preparations of cereals, flour, starch or milk; pastrycooks' products	*(92,2)* 97,3	*(92,4)* 91,4	*(94,4)* 90,7	*(99,8)* 100	*(92,2)* 93,1	*(53,3)* 55,7	*(90,3)* 99,7	*(64,2)* 64,9	*(85,9)* 87,1
Preparations of vegetables, fruit, nuts or other parts of plants	*(68,5)* 74,7	*(64,9)* 44,2	*(55,4)* 72,9	*(97,0)* 97,5	*(46,3)* 54,8	*(46,4)* 54,1	*(31,1)* 48,3	*(28,2)* 34,4	*(57,8)* 62,6
Beverages, spirits and vinegar	*(30,2)* 71,8	*(69,5)* 96,7	*(69,1)* 75,5	*(59,4)* 90,6	*(22,6)* 23,2	*(33,5)* 33,2	*(22,4)* 67,6	*(26,5)* 32,6	*(39,9)* 58,1
Other food industry products	*(88,5)* 92,0	*(80,9)* 80,1	*(95,7)* 91,0	*(95,9)* 97,1	*(86,4)* 89,6	*(47,4)* 78,0	*(46,8)* 54,7	*(31,3)* 69,1	*(76,7)* 85,0
TOTAL FOOD INDUSTRY PRODUCTS	*(62,9)* 79,3	*(75,5)* 70,1	*(79,9)* 83,6	*(86,2)* 94,2	*(59,6)* 62,5	*(51,4)* 58,9	*(42,2)* 64,5	*(38,3)* 51,9	*(64,9)* 72,7

(*) Figures belonging to 1993 appear between brackets.
(**) Including Ireland, Denmark, Greece and Portugal.

TABLE 9.- CHARACTERISATION OF TWO-WAY INTRA EU-12 TRADE OF FOOD INDUSTRY PRODUCTS, 1993(*) and 1997. Percentages on aggregate intra EU-12 trade.

	France		*Netherlands*		*Germany*		*Belgium and Luxembourg*		*United Kingdom*	
	Horizontal	*Vertical*	*Horizontal*	*Vertical*	*Horizontal*	*Vertical*	*Horizontal*	*Vertical*	*Horizontal*	*Vertical*
Preparations of meat, fish or aquatic invertebrates	*(25,2)* 61,5	*(57,7)* 28,1	*(39,3)* 26,1	*(57,1)* 35,5	*(33,3)* 43,2	*(57,1)* 50,7	*(33,0)* 23,6	*(45,3)* 58,9	*(29,1)* 18,3	*(27,7)* 59,3
Sugars and sugar confectionery	*(23,1)* 1,7	*(2,2)* 21,1	*(39,5)* 29,3	*(36,6)* 69,6	*(62,2* 36,2	*(15,1)* 47,1	*(36,8)* 3,0	*(55,4)* 92,2	*(25,0)* 2,5	*(72,4)* 92,8
Cocoa and cocoa preparations	*(95,5)* 48,1	*(4,2)* 45,7	*(23,6)* 30,4	*(35,9)* 6,5	*(24,8)* 30,6	*(58,9)* 55,5	*(40,4)* 23,9	*(50,3)* 65,0	*(88,5)* 69,4	*(11,4)* 16,3
Preparations of cereals, flour, starch or milk;…	*(15,9)* 24,8	*(76,3)* 72,5	*(3,0)* 34,4	*(89,4)* 57,0	*(61,2)* 65,1	*(33,2)* 25,6	*(78,9)* 71,4	*(20,9)* 28,7	*(11,0)* 30,8	*(81,2)* 62,3
Preparations of vegetables, fruit, nuts or other …	*(20,2)* 31,2	*(48,3)* 43,5	*(3,5)* 6,7	*(61,4)* 37,5	*(11,9)* 22,9	*(43,5)* 50	*(55,3)* 49,4	*(41,7)* 48,1	*(9,2)* 3,4	*(37,1)* 51,4
Beverages, spirits and vinegar	*(4,1)* 44,4	*(26,1)* 27,4	*(12,3)* 2,6	*(57,2)* 94,1	*(4,7)* 9,7	*(64,4)* 65,8	*(28,4)* 35,1	*(31,0)* 55,5	*(6,4)* 1,7	*(16,2,* 21,5
Other food industry products	*(3,2)* 15,1	*(85,3)* 76,9	*(15,2)* 38,0	*(65,7)* 42,1	*(25,9)* 20,0	*(69,8)* 71,0	*(60,7)* 63,4	*(35,2)* 33,7	*(10,7)* 18,0	*(75,7)* 71,6
TOTAL FOOD INDUSTRY PRODUCTS	*(17,4)* 35,8	*(45,5)* 43,5	*(14,3)* 24,1	*(61,2)* 46,0	*(26,3)* 28,3	*(53,6)* 55,3	*(49,1)* 38,3	*(37,1)* 55,9	*(20,9)* 13,7	*(38,7)* 48,8

(*) Figures belonging to 1993 appear between brackets.

TABLE 9 (Continuation).- CHARACTERISATION OF TWO-WAY INTRA EU-12 TRADE OF FOOD INDUSTRY PRODUCTS, 1993(*) and 1997. Percentages on aggregate intra EU-12 trade.

	Italy		*Spain*		*Rest of European Union-12(**)*		*European Union-12*	
	Horizontal	*Vertical*	*Horizontal*	*Vertical*	*Horizontal*	*Vertical*	*Horizontal*	*Vertical*
Preparations of meat, fish or aquatic invertebrates	*(23,4)* 2,8	*(41,8)* 74,1	*(15,1)* 24,6	*(53,4)* 40,5	*(9,2)* 5,1	*(29,7)* 38,2	*(26,2)* 26,4	*(45,1)* 46,8
Sugars and sugar confectionery	*(88,1)* 86,9	*(5,2)* 10	*(3,6)* 30,2	*(34,0)* 16,3	*(26,6)* 17,6	*(40,3)* 52,1	*(37,1)* 20,0	*(28,8)* 49,9
Cocoa and cocoa preparations	*(26,5)* 21,2	*(70,4)* 72,4	*(13,0)* 46,1	*(79,4)* 51,3	*(9,9)* 18,4	*(48,8)* 42,1	*(43,4)* 45,3	*(40,8)* 35,4
Preparations of cereals, flour, starch or milk;…	*(24,3)* 0,3	*(29,0)* 55,4	*(17,4)* 13,0	*(72,9)* 86,7	*(26,3)* 14,5	*(37,9)* 50,4	*(37,0)* 31,3	*(48,9)* 55,8
Preparations of vegetables, fruit, nuts or other …	*(15,7)* 22,5	*(30,7)* 31,6	*(0,2)* 14,7	*(30,9)* 33,6	*(5,9)* 6,7	*(22,3)* 27,7	*(13,8)* 20,7	*(44,0)* 41,9
Beverages, spirits and vinegar	*(10,6)* 0,0	*(22,9)* 33,2	*(0,8)* 9,7	*(21,6)* 57,9	*(3,6)* 1,9	*(22,9)* 30,7	*(7,8)* 16,7	*(32,1)* 41,4
Other food industry products	*(4,3)* 29,5	*(43,1)* 48,5	*(5,5)* 3,5	*(41,3)* 51,2	*(9,5)* 20,5	*(21,8)* 48,6	*(18,1)* 24,5	*(58,6)* 60,5
TOTAL FOOD INDUSTRY PRODUCTS	*(17,2)* 16,2	*(34,2)* 42,7	*(4,8)* 15,9	*(37,4)* 48,6	*(10,5)* 11,2	*(27,8)* 40,7	*(21,2)* 24,7	*(43,7)* 48,0

(*) Figures belonging to 1993 appear between brackets; (**) Including Ireland, Denmark, Greece and Portugal.

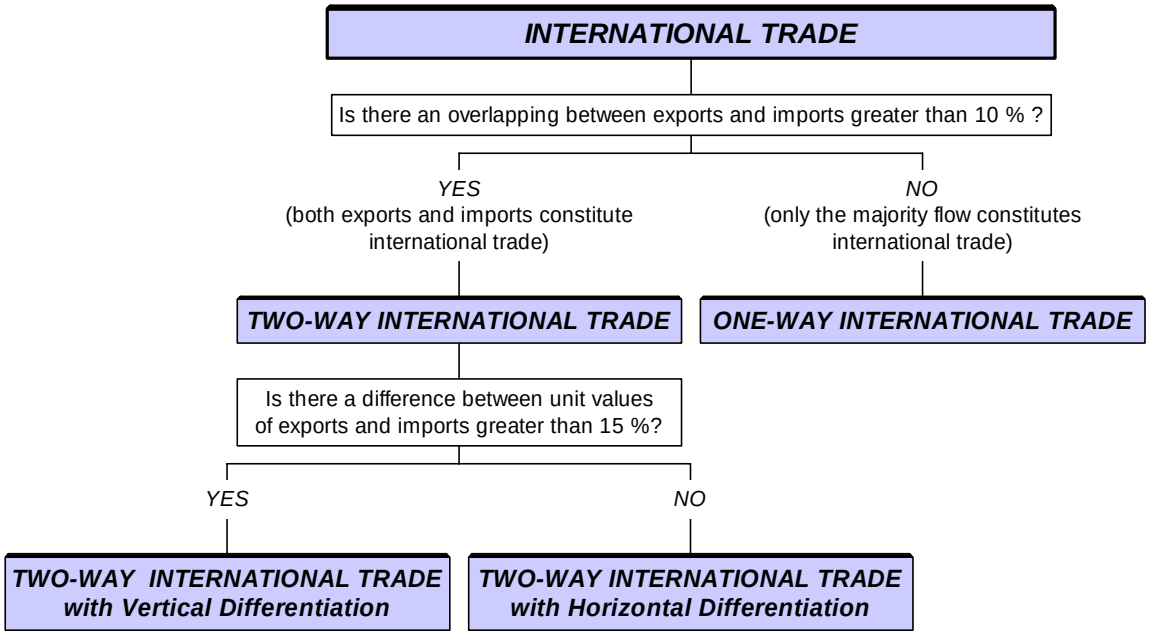
Without pretending explain through the values attained by our *quality indices* the changes in *country shares* in the shipments to the European food market, that obviously respond not to a single cause but to a wide range of micro and macroeconomic factors that remain outside of the objectives of this paper, it is empirically easy to note that both types of data are quite coherent to each other. One of the most remarkable hints is that *Spain*, the country that in greater measure progresses in her quality index, registers a raise of 48 percent in their market share, upon passing from 4 to 5,9 percent, while the *United Kingdom* occupies the second position, with an increase of 9 percent. At the same time, the figures highlight that *Italy*, the single country that appears in the less favourable position from the point of view of her quality indices, is also the country that in a greater proportion suffers from a diminishing food market share. It is worthy also of mention the important fall in market share (a reduction close to 25 per cent), that experience the group of countries classed under the category *remainder of the EU*, that is to say *Ireland*, *Denmark*, *Greece* and *Portugal*. It is difficult then to discard the hypothesis that the expansion of *intraeuropean* trade in food industry products has drifted towards high price and high quality varieties within each widely defined product category, and that countries that have shown a greater flexibility in order to adapt their export flows in accordance with this tendency have possibly enjoyed a competitive advantage in the European market conducive to a gain in terms of their weight in *intraeuropean* food shipments.

4. Characterisation of the intraeu-12 food industry trade.

Under this heading a classification of *intraeuropean* food industry trade flows is attempted for the same countries and industrial branches that have been utilised in the calculation of the previous indices, but adding a new sector, *other products of the food industry*, that for the wide heterogeneity of items included in its coverage, was not fit for the calculation of quality indices. We have proceeded to distinguish within the commercial flows that each country maintains with the other member states of *EU-12*, *one way* type of *trade* (*interindustry* trade) from *two way* type of trade (*intraindustry* trade); then we have taken steps to perform a new division inside this last category according to the criterion of *horizontal* product differentiation *versus vertical* differentiation. In order to make these concepts operational we have adopted the methodological approach proposed by the European Commission (1997), that finds its precedent in the work of Abd-El-Rahman (1984) (see also Abd-El-Rahman, 1991), subsequently developed by Freudenberg and Müller (1992).

The classical approach to *intraindustry trade* measurement starts from the well-known *Grubel-Lloyd* index (Grubel and Lloyd, 1975), that pretends to gauge the grade of overlapping between imports and exports flows, so that when it happens, the minority flow (being exports o imports) is considered of an *intraindustry* nature, while the remainder is assumed to belong to the category of *interindustry* trade. We depart from this traditional computation, to follow a method that implicitly supposes that when a certain level of overlapping is reached between imports and exports of some product category (a threshold fixed in advance in order to differentiate between *one way* and *two way* trade), the entirety of commercial flows in that product line is marked as *two way* trade. This approach allows then to distinguish three types of international trade according to the level of overlapping that arises when comparing imports and exports, on one hand, and to the divergence in *unit values* of exported and imported items within the same type of products, on the other (*Figure 2*).

Figure 2: CHARACTERISATION OF INTERNATIONAL TRADE.



Source: European Commission (1997)

One way trade of *interindustry* type appears when overlapping between import and export flows doesn't exist or when it is less than 10 per cent as a proportion of the largest flow. It means in practice that for a *k* product category *one way* trade will exist when:

$$\frac{Minimun\left(x_k, m_k\right)}{Maximun\left(x_k, m_k\right)} < 10\ \% \qquad (10)$$

In this case, the majority flow constitutes *interindustry* trade, while the minority one is dealt with as a residual flow. *Two way* trade will come into existence when the degree of overlapping between both sides of trade is equal or higher than 10 per cent. In this second case, it is possible to break the amount of *two way* trade into two components (*horizontal* and *vertical*) according to the similarity or divergence of unit values for imports and exports for each broad product category and each country; *two way horizontally differentiated* trade will exist when this divergence doesn't exceed 15 per cent:

$$\frac{1}{1{,}15} \leq \frac{Unit\ value\,(x_k)}{Unit\ value\,(m_k)} \leq 1{,}15 \qquad (11)$$

Otherwise, when the difference of unit values for imports and exports of a single country and product category, surpasses the aforementioned threshold of 15 per cent, *two way vertically differentiated* trade will occur.

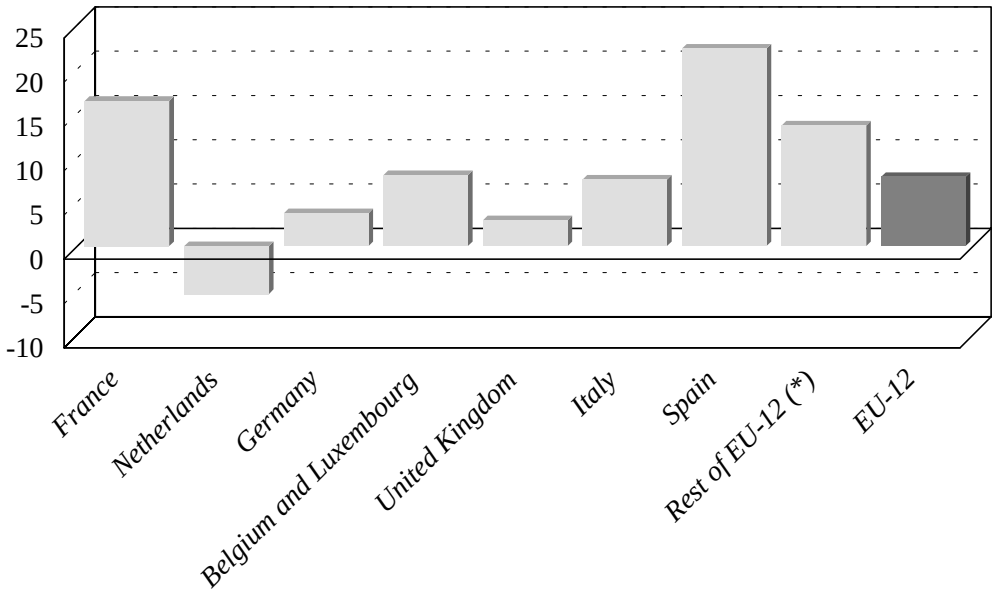
In order to illustrate how to proceed to build up aggregate measures, a variable *S* must be defined to show the weight of, say, *two way horizontally differentiated trade* (represented by *twhdt*) on the total amount of trade for the *k* products of an industrial sector *i*:

$$S^i_{twhdt} = \frac{\sum_{k \in twhdt}\left(x^i_k + m^i_k\right)}{\sum_k \left(x^i_k + m^i_k\right)} \qquad (12)$$

The figures displayed by *Table 8* pick up the percentages of participation of *two way trade* on intraeuropean trade of food industry products; in all cases, this is the prevailing type of trade in 1997, and also in 1993, except for *Spain* and for the countries grouped under the *remainder of the EU* denomination, that, with the exception of *Denmark*, all belong to the less developed area of the *European Union*. It makes up for almost three quarters of the *intraeuropean* trade and in some cases (*France*, *Germany* and *Belgium-Luxembourg*) it covers 80 per cent or more of the global value of food shipments *to* and *from* the internal *European* market. With the exception of *the Netherlands*, all the other countries share a common trend to increase the relative importance of this type of commerce in the period analysed, and it acquires special relevance in the case of *Spain*, where *two way trade* gains more than twenty percentage points in 1993-97, as

well as in *France* and in the countries that belong to the *remainder of the EU* group, where it advances almost fourteen points (*Figure 3*).

Figure 3: SHARE BY COUNTRIES OF TWO WAY TRADE ON INTRA EU-12 TRADE OF FOOD IDUSTRY PRODUCTS. Percentage points of change between 1993 and 1997.

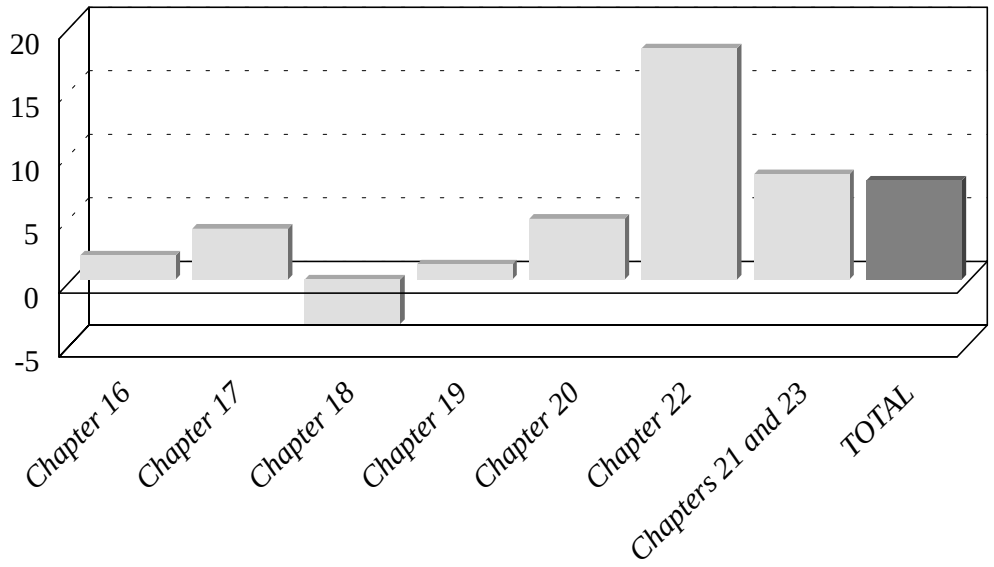


For the *European Union* as a whole the highest *ratios* of *intraindustry trade* correspond to *cereal products* and to the *other food industry products* category, while the lowest appear in *beverages* and in *preparations of vegetables and fruits*. Differences between countries in the proportion of their commerce with the rest of the *European Union* that can be ascribed to the category of *two way trade* are very important. In the case of *sugar and confectionery* only 22 per cent of trade with origin or destination in *France* could be possibly classified as *two way trade*, but on the other hand it would almost reach 99 per cent for *the Netherlands*. It may be suggested that it is in those products where a country has developed a strong export position and traditionally supplied its domestic market with its own produce, where the indices of *two way trade* are likely to show the lowest values. It could be the case for *pasta* (made from cereals) in *Italy*, for *vegetable and fruits prepared products* in *Spain* or for *beverages and liquors* in *France*, because all those products show up in *Table 8* with some of the lowest percentages of *two way trade.*

Figure 4 shows the trend followed by the share in total trade of *two way trade* in the different product categories, while *Table 9* classifies global intra-European *two way trade* flows of each country, in accordance to the criterion that distinguishes between

vertical and *horizontal* product differentiation, formulated in expression (11). This criterion, adopted from European Commission (1997) responds to the importance of unit value discrepancy when comparing imports and exports for the same type of traded item. For countries and sectors altogether the observations in which *vertical differentiation* prevails are four times more common than the opposite, in 1993 as well as in 1997. A global view of *two way* food trade also conveys the same impression, *vertical differentiation* is predominant in all countries and both years (the only exception being *Belgium* in 1993).

Figure 4: SHARE BY CHAPTERS OF TWO WAY TRADE ON INTRA EU-12 TRADE OF FOOD INDUSTRY PRODUCTS. Percentage points of change between 1993 and 1997.



Chapter 16.- Preparations of meat, fish or aquatic invertebrates. Chapter 17.- Sugars and sugar confectionery. Chapter 18.- Cocoa and cocoa preparations. Chapter 19.- Preparations of cereals, flour, starch or milk; pastrycooks' products. Chapter 20.- Preparations of vegetables, fruit, nuts or other parts of plants. Chapter 22.- Beverages, spirits and vinegar. Chapters 21 and 23.- Other food industry products

A distinct issue is the trend in the relative importance of the two aforementioned types of *intraindustry* trade, where marked differences appear at national level. For the *European Union* as a whole both types of trade are on the rise as it does their relative weight within total *intraeuropean* trade. Only in two countries, *France* and *the Netherlands*, the *vertical trade* share is lower in 1997 than in 1993. According to the type of product, and for the *European Union* as an entity, in all cases, *vertical differentiation* achieves higher relevance than *horizontal differentiation*, with the exception of *cocoa and its products*; *sugar and confectionery* is also an exception, but only for 1993.

5. Concluding remarks.

The use of the theory of index numbers allows to make comparisons between the quality levels of two flows of trade that can correspond to export or import sets, different countries or different moments along time. This paper uses this approach to establish the relative quality levels of the food industry shipments to the *European internal market* from *European Union* member countries, for the period 1993-97. It is found that a positive relationship exists between the evolution of country shares on the food industry *European internal market* and the ability to achieve growing quality levels in the composition of exports flows, in such a way that countries with more important market share gains are also those that have achieved higher improvements on their quality levels.

This paper also aims to quantify the *intraeuropean* food industry trade, according to the pattern of commercial specialisation adopted. It is important since it is clear that Krugman´s type intra-industry trade is only one of the possible models to understand international trade flows in the real world. As this paper shows most of the *intraeuropean* trade within the agrofood sector can be characterised as *intraindustrial* trade (*two way trade*), which in addition shows from 1993 onwards a growing relative weight in most of the European countries. This being the case, adjustment costs could be substantial, since vertical differentiation is based on comparative advantage, and as our results show, within *two way trade*, vertically differentiated trade clearly predominates. This result points out to the necessity of considering not only the adjustment costs to the *European Single Market* derived from *interindustrial* trade flows, but also those coming from *intraindustrial* flows based on vertical differentiation and quality differences of traded goods.

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